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Determinant of Technical Efficiencies of Micro and Small Enterprises in Wolaita Zone, Ethiopia

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Abstract
Efficiency is very important factor for productivity growth. In an economy where resources are scarce and opportunities to use new technologies are limited, studies indicate potential possibility to raise productivity by improving efficiency without necessarily developing new technologies or increasing the resource base. The objective of this study was to determine the technical efficiencies of MSEs in Wolaita Zone, Ethiopia. A multi-stage sampling technique was used to select 352 enterprises by employing Yamane formula. Data were analyzed by using Data envelopment technique. Findings show that the mean level of technical efficiency was 0.61 for both MSEs together, 0.59 for micro-enterprises and 0.67 for small enterprises. Results indicated that dependent variable which is defined as technical efficiency of MSEs was affected by explanatory variables: age of promoters, managerial training, vocational training, access to finance, family size, location of the enterprises, enterprises age, business plan, investment on ICT, Initial capital, enterprises size, social networking, were included in the model. From twelve possible factors, eight of the explanatory variables age of promoters, enterprises size, vocational training, and investment in ICT, initial capital, social networking, family size and business plan affected technical efficiency significantly. Based on the finding age of promoters, social networking, initial capital, vocational training and investment in ICT were significantly and positively determined technical efficiency while business plan and enterprises size significantly and negatively determined technical efficiencies. These results suggest that increased investment in ICT and vocational training could jointly contribute to an improvement in technical efficiency. Enhancing share capital contribution, enhancing micro-financing efficiency, infrastructural facilities and information dissemination, educating and training of MSEs promoters in business development services (BDS) were recommended to enhance technical efficiency in optimal input usage to obtain maximum output.
Keywords: Data Envelopment analysis, MSEs, Technical efficiency, Tobit Model, Wolaita Ethiopia.

1. INTRODUCTION

Micro and Small Enterprises (MSEs) play a pivotal role in the socio-economic development and growth of nations. MSEs have greater economic benefits than large firms in terms of employment generation, efficiency, and growth since they use more of what a country is endowed with and less of what it lacks (Admassie and Matambalya, 2002). They are particularly important for developing countries not only because they absorb labor, but also because they usually use unskilled workers whose supply is in excess in these countries. Unlike large-scale enterprises, which are often capital-intensive and import-dependent for raw materials and machinery, MSEs mostly use locally available resources. By creating employment opportunities for the semi-skilled and unskilled labor, MSEs could increase the household income of the labor force at the micro level and reduce the level of poverty at the macro level, apart from creating the basis for a more sustainable industrial development.

Moreover, MSEs' nurture indigenous entrepreneurial and managerial talents which foster economic development, poverty reduction and employment generation (Eshetu and Zeleke, 2009). The MSEs meet the local needs for goods and services, using locally available technology and infrastructure. In general, MSEs pave the way for transforming the economic structure and engender the participation of diverse segments of the population in developing countries (Admassie and Matambalya, 2002). Hence, it is to say that promoting MSEs has become a preferred development strategy in many developing countries including Ethiopia.

Government of Ethiopia has acknowledged the role of these enterprises in the economic growth and transformation. The Growth and Transformation Plan (GTP I), for instance, has envisaged that micro and small scale enterprises create employment opportunities for about three million people and thereby enhance income, domestic saving, create employment and reduce poverty, particularly benefiting the women and the youth (MoFED, 2014).

The Government is promoting financial and business development services (BDS) for helping MSEs attain their intended objectives. The financial service includes credit and saving scheme whereas BDS include training, technology transfer, counseling, provision of working premises and the like (Eshetu and Zeleke, 2009). The government's promotion policy leads the local economy to increase the competition among enterprises within

the economy and private sector. This leads to productivity and efficiency gain among MSEs which help them to compete in domestic and global markets.

Sustainable development strategies for MSEs are evolved after systematic analysis of the problems and appropriate solutions. MSEs in Ethiopia, however, suffer from limitations. Among others, insufficient training was the major ones affecting performance of MSEs (Werotaw, 2010). In general, there are external and internal factors which impair the performance of MSEs.

The key challenges to the long term survival and growth of MSEs in Ethiopia are lack of basic entrepreneurial and managerial skills, poor efficiency, lack of access to finance, and information asymmetry between bankers and MSE community and the risk profile of the sector (MUCD, 2013). The commercial banks and formal financial institutions are reluctant to provide finance to small businesses due to managerial inefficiency and lack of accurate information required for assessing the risk of lending money to small businesses (Eshetu and Zeleke, 2008). Technical and managerial inefficiency results market failures. The market failure eventually discourages the new players while the existing players in turn reduce their production leading to the stunted sector. This impairs employment and poverty reduction potential of MSE.

The above facts have been corroborated by recent research studies as well. The study conducted by Habtamu *et al.*, (2013) reveals that large numbers of MSEs are unable to grow, in terms of employment and capital and remain in survival-mode. Moreover, out of 1000 MSEs in the country around 69 per cent were found to be survival-types (Gebreeyesus, 2007) that too in the capital city of Addis Ababa. Around 76 per cent of the MSEs are unable to grow at all since their establishment and only 22 per cent of the MSEs increased their work force (Wasihun and Paul, 2010). Field observations of the researcher besides his professional experience, and Trade and Industry statistical abstract showed that the MSEs at Wolaita Zone continue to be capital-starved and remain low in their job creation potential. Furthermore, the Zone has not yet exploited their potential very well to contribute towards economic development, job creation and poverty reduction. Their contribution to the local economy, capital accumulation and employment generation remains much low. In addition, as to the knowledge of the authors, no study is undertaken so far in the study area and a few studies probed the issue of MSEs in Ethiopia as a whole. Eshetu and Zeleke (2008) investigated Efficiency and Social Capital in MSEs in major Cities of Ethiopia.

The effectiveness of above interventions, however, depends on identifying key factors that foster or inhibit efficiency of MSEs. MSEs are heterogeneous in objective, capability and competencies. They differ in terms of the promoters and firms' socioeconomic background, access to scale economies and financial resources. Understanding the different factors affecting and the attributes of efficiency and their influence on growth is crucial in order to formulate effective policies

Labor productivity, among others, is an underlying economic factor for sustainability, growth of MSEs and maintaining competitiveness in the domestic as well as globalised economy (Altenburg, 2010). Developing technical skill of labors and managers will lead to higher productivity levels among MSEs (Altenburg, 2010*)*. One possible method which could be adopted by MSEs to overcome managers and labor inefficiency problems is to improve internal efficiency. Improving technical efficiency will be an important means for MSEs to grow and expand in a competitive environment (Admassie and Matambalya, 2002; Altenburg, 2010). Due to the resource constraints, MSEs could not attract internal investments at an expected scale. This issue could be addressed through more efficient function of the surviving MSEs in the country. Therefore, this study was initiated to identify determinants of technical efficiencies of Micro and Small Enterprises in Wolaita Zone, Ethiopia. Besides, the study is meant to generate empirical evidences thus contribute to the knowledge and understanding of development actors who may involve in future research on planning and promotion to optimize the use of inputs to maximize the outputs of MSEs.

This paper was organized into four parts. The first part presents introduction. The second part describes methodology used to achieve the objectives. The third part presents results and discusses findings in which Data envelopment analysis and Tobit model results were used. The last part includes recommendations towards policy implementation.

2. RESEARCH METHODOLOGY

2.1 Description of Study Area

Wolaita Zone is one of 14 zones in *Southern Nation, Nationalities and People Region (SNNPR)*. The capital of the Zone, *Sodo* town, is situated at 387 km to the north of *Addis Ababa* city, the capital of Ethiopia. Based on Central Statistical Authority (CSA, 2007) total population projection of the Zone which estimated 1,796,578 out of which 49.27 per cent are Males and 50.73 per cent are Females (CSA, 2007). The population density of the Zone is 445 persons per Km^2. The average urban household size is 4.8 and dependency ratio is 100. The total geographical area of the Zone is 2,355Km^2. Micro and Small Enterprises (MSEs) play an important role in creating income and employment opportunities resulting beneficial impact on poverty reduction in the Zone. MSEs are predominant sector of the economy next to agriculture in the Zone. Starting from 1997-2015, statistical abstract of Wolaita Zone

Trade and Industry Department (WOZTID, 2015) confirms 2,740 MSEs were established which consists of 2548 micro and 192 small enterprises. Similarly the sector further classified in to different economic activities i.e. manufacture 357(13.1 per cent), construction 814(29.7 per cent), service 748(27.3 per cent), trade 612(22.3 per cent) and urban agriculture 209(7.6 per cent) and which created jobs for 10,935(67.5 per cent) Males and 5,256 (32.5 per cent) Females with total of 16,191 people. There are large numbers of Micro and Small Scale Enterprises in the Zone. However, the Zone has not yet exploited their potential very well to contribute towards economic development, job creation and poverty reduction in the Zone and the country as a whole. Their contribution to the local economy, capital accumulation as well as employment generation remains much limited. Apart from MSEs trading, income from casual labor and seasonal workforce movement during harvest time is another source of income in the Zone.

2.2 Sampling Technique

Multistage sampling technique was employed for selection of the representatives of MSEs. At the first stage, Wolaita Zone was purposively selected because the largest number of MSEs present in the Zone. Besides, Wolaita Zone has unexploited potential that could definitely serve as business area for MSEs. Further, Wolaita Zone is the catchment area for the research and development program of Wolaita Sodo University. At the second stage, three administrative towns were selected purposively from the target Zone because of the largest numbers of MSEs and members presence there

At third stage of sampling design, stratified random sampling technique was used to select the sample for study from the study area. The use of stratified random sampling technique was justified on the ground that the population of interest is heterogeneous; hence, it is necessary to classify the population of interest into non-overlapping elements or strata. The heterogeneous population of interest in each town is divided into three strata. These are both MSE together, Micro and Small Enterprises that were major components of MSEs in the study area.

2.3. Sample Size Determination

To determine appropriate sample size simplified formula which was developed by Yamane (1967) was used. $\boldsymbol{n = \frac{N}{1+N(e^2)}}$ **..... (1)**

Where, assume n=required sample size; d =degree of accuracy expressed as a proportion of (0.05); and N= total population of MSEs in the division. The required sample size was computed from the population of 790 and 112 Micro and Small enterprises respectively present in the study area. Eventually, 265 and 87 from micro and small enterprises respectively were selected by using the sample size determination formula.

Proportional allocation procedure was used to determine the sample size of each stratum. The total sample size from micro-enterprise was proportionally distributed to each administrative town based on 265/790= 0.335 is the multiplication factor whereby the numbers of active town are multiplied to provide the proportional sample size. From 265 micro-enterprises (37 from Boditi, 177 from Sodo, and 51 from Areka) and similarly, sample size from small-enterprises were again proportionally distributed to each administrative town based on 87/112= 0.776 is the multiplication factor whereby the numbers of active towns are multiplied to provide the proportional sample size that is the sample of 87 small-enterprises (18 from Boditi, 51 from Sodo, and 18 from Areka) were proportionally selected from each administrative town is multiplied to provide the proportionate sample size. Accordingly, the total sample proportionally selected was 352 (228 from Sodo, 69 from Areka and 55 from Boditi). Finally, systematic sampling technique (K= N/n) formula was employed to draw each enterprise from each sector

2.4 Data Sources and Methods of Data Collection

Both qualitative and quantitative data were collected from primary and secondary sources. Quantitative data from primary sources were collected through interview schedule while qualitative data were collected through key informant interview, focus group discussions and personal observations. The relevant data were collected from 352 sample managers. An interview schedule was prepared in English and translated into Amharic to ease communication during the data collection. The interview-schedule was pre-tested before actual data collection and necessary corrections were made in the final version of interview-schedule. Five enumerators were recruited based on their proficiency in local language, educational background and prior exposure to survey research. Training was given to enumerators on the content of the interview schedule and procedures to follow while conducting interview. The survey focused on socioeconomic, individual and firm related, institutional and linkage related factors. Secondary data were collected from *Wolaita* Zone trade and industry promotional department, Micro finance institution, Journals, and Central Statistical Authority (CSA) publications, published and unpublished documents of national, regional and zonal offices.

2.5 Method of Data Analysis

Model Specification

The production frontier is based on the theoretical work of a production function which represents ideally the maximum output attainable from given set of inputs. Based on the concept of frontier, technical efficiency is defined relative to production frontier consequently; MSE is said to be efficient if it is operating on the production frontier. Meanwhile, MSE is said to be technically inefficient when it fails to achieve the maximum output from the given inputs. In empirical works on the efficiency of MSE has two approaches, i.e., parametric -Stochastic Frontier Approach (SFA) and non-parametric - Data Envelopment Analysis (DEA) have been overwhelmingly dominating (Coelli *et al.*, 2005). Both approaches provide measures of technical efficiency as a radial distance from the best practice frontier. However, each approach obtains technical efficiency scores by utilizing different techniques. The DEA involves the use of linear programming whereas stochastic frontiers involve the use of econometric methods (Coelli*et al.,* 2005). As the SFA impose functional and distributional forms on the error term, the DEA does not require any functional form to be specified. Further, while the former distinguishes the component of inefficiency in to random and inefficiency effect, the later deems any deviation from the efficiency frontier to the result of inefficiency.

Seemingly, both have pros and cons and the superiority of one over the other approach has been a subject of discussion and remains an issue in literature. For the purpose of this study, the popular non parametric Data Envelopment Analysis (DEA) has been chosen for two reasons. First it considers multiple inputs and multiple outputs; hence suitable for MSEs (i.e it accounts the dual objectives: social and financial).Second, it does not require a prior assumption about the analytical form of the production function. For the purpose of consistency and robustness of the results, the study also estimates the technical efficiency of the MSEs using the SFA and then tries to compare the results with those derived from DEA.

Inputs and outputs in the analysis were determined based on the dual objectives of MSEs (financial and social). As mentioned earlier consequently, the study specifies three inputs and three outputs; human capital, costs and managements are specified inputs whereas the three outputs are financial results sales income (revenue), number of clients and survival. According to Amornkitvkel *et al*., (2014), it is necessary to select orientation from input oriented DEA model or output oriented DEA model according to which quantities the decision maker has more control over. The estimation is obtained from the difference between technical efficiency values under the constant returns to scale (CRS) assumption where all decision making units operate at their suitable level. Under imperfect competition situation certain DMUs may not be able to operate at the suitable level; hence, the variable returns to scale (VRS) assumption is more realistic and flexible to allow the envelopment of more observed data than the case of CRS assumption. As a result the variable returns to scale DEA model was applied for this study. Therefore, the outcomes of DEA of this study are efficiency scores which represent performance indicators as 1 = best performance and 0 = worst performance. The best of efficient DMUs lie on the frontier while the inefficient ones lie below the frontier. The efficient DMUs can be considered as benchmark of the inefficient DMUs. The inefficient DMUs can improve their performances to reach the efficient frontier by decreasing their current input levels (Cooper *et al*., 2006). The efficiency scores can be calculated by using a linear programming model as presented in Trans *et al*., (2008).

$\frac{\sum_{r=1}^{s} u_r y}{\sum_{i=1}^{m} v_i x}$ = max h_o …… (2)

Subject to $\frac{\sum_{i=1}^{s} u_r y}{\sum_{i=1}^{m} v_i x} \leq 1$ U, v ≥ 0

The individual DEA efficiency score varies between 0.00 and 1.00. This means the efficiency scores are double-truncated at 0 and 1. Though other types of regression model such as multiple linear and one sided Tobit regression models can be applied only if the efficiency scores do not assume both or either of the upper and lower limits. Therefore, in this study, the two-limit tobit regression model was applied to identify the sources of efficiency since the dependent variable in this case assumed 0 as lower limit and 1 as upper limit (Maddala, 1999). The two-limit Tobit model is defined as

Where Y= latent variable representing the efficiency scores of firm i, β = a vector of unknown parameters, X_{jk} = a vector of explanatory variables m (K = 1, 2... n) for firm i and U_i = an error term that is independently and

$$Y_{ki} = \beta_{ki} + \sum_{i}^{j} \beta_{ki} x_{ik} + u_{ki} \quad \text{.....(3)}$$

normally

distributed with mean zero and variance σ^2.
Denoting Y_i as the observed variable

$$Y_i = y^* \begin{cases} 1 & \text{if } y_i^* \geq 1 \\ & \text{if } 0 < y_{i^*} < 1 \\ 0 & \text{if } y_{i^*} \leq 0 \end{cases} \quad \text{---------- (4)}$$

The distribution of dependent variable in equation above is not normal distribution because its value varies between 0 and 1. The ordinary least square (OLS) estimation will give biased estimates (ibid). Therefore, the alternative approach is using the maximum likelihood estimation which can yield the consistent estimates for unknown parameters vector. Because the dependent variable will be used to measure the level of efficiency, the variables with a negative (positive) coefficient will have a positive (negative) effect on efficiency levels. Accordingly, the likelihood function of this model is given by:

Where $L_{1j} = 0$ (lower limit) and $L_{2j} = 1$ (upper limit) where (.) ϕ and (.) φ are normal and standard density functions. In practice, since the log function is monotonically increasing function, it is simpler to work with log of likelihood function rather than likelihood function and the maximum values of these two functions are the same

$$L\beta,\sigma / y_{i,}, X_j, L_{1J}, L_{3j} = \prod \phi\left[\frac{L_{1j} - \beta X_j}{\delta}\right] \prod \frac{1}{\sigma}\phi\left[\frac{y_i - \beta X_i}{\sigma}\right] \prod 1 - \phi\left[\frac{L_{2j} - \beta X_i}{\sigma}\right] \text{.....(5)}$$

(Greene, 2003).

To identify the marginal effect yields, Belasco (2007) used the proportion of uncensored variables of mortality losses and average daily gain. Sriboonchitta and Wiboonpongse(2006) also used technical efficiency of Micro and Community Enterprises in the Upper North of Thailand. Apart from the estimated coefficients, the marginal effects of the probability of technical efficiency of MSE were calculated by multiplying the estimated coefficients by predicted value of uncensored observation which was calculated from Tobit model. This meant that it was similar to estimated coefficients multiplied by scaling factor or the proportion of uncensored observations. The important point here was that variables influencing the probability of a non-zero value need to increase or decrease the conditional mean of the values in Tobit model in the same way.

This study explored determinant of technical efficiency in Wolaita Zone. The MSEs efficiency was affected by several factors. These factors were vocational training, size of the enterprises, managerial training, business plan, and access to finance, investment in ICT, location, family size, age of promoters, social network, initial capital and enterprises age. For the analysis of technical efficiency of MSEs, the Data Envelopment Analysis (DEA) was employed. The factor affecting the level of efficiency was achieved through Tobit model. Therefore, Efficiency Index= f(vocational training, size of the enterprises, promoters training, business plan, access to finance, investment in ICT, location, family size, promoters age, social network, initial capital and enterprises age).

Table 1. Independent Variables and their Expected Signs (Tobit Estimates)

Variable Code	Description and measurements	sign
AGE	Age of Promoters in continuous measurement (in years)	-
INCAP	Amount of Initial capital (in Birr)	+
VOCT	Vocation training, dummy (1= if received training and 0 otherwise)	+
CAICT	Investment on ICT and Utilization in continuous form(in Birr)	+
SNET	Social network that possessed by MSE (1= MSEs accessed the social network and 0= otherwise)	+
AFIND	MSEs owners accesses to Finance (1= if accessed and 0 otherwise)	+
MTRICD	Duration of skill training provided for Promoters (in months)	+
BUSPL	Business plan (1= if MSE owned business plan and 0 otherwise)	+
FASIZE	Family size in households (in numbers)	+
LOC	Location of the MSEs (1= if chosen commercial area and 0 otherwise)	+
AGEF	Age of the MSEs in continuous form measurement (in years)	-
FSIZE	Size of the MSEs in continuous form measurement (in number of employees)	-

3 Results and Discussions

3.1 Descriptive Analysis

Age of Promoter: The result indicated (Table---) that youth dominated the sector. The average age of the respondents in Micro, Small and both enterprises was 33.6, 32.9 and 33.3 years respectively. MSEs Strategy of Ethiopia (2011) lays emphasis on supporting youth coming forward to set up enterprises. The average age profile of the respondents appeared to be in line with the objective of the MSE policy. Age of promoter has bearing on efficient in ambition, determination, and willingness to test abilities and in turn on the MSEs' growth. It was also

worth noting that some promoters were over 50 years of age, evidencing the richer experience behind them. The average age of promoters had significant difference between Micro and Small enterprises at less than one per cent significant level (t = 88.89; p=0.000). This finding was consonant with the study of (Welter, 2001 and Fekirite and Endrias, 2013). Table 2

ICT Investment: The technology particularly Information Technology (ICT) increases the resource use efficiency of any business. It enhances the cost efficiency maximizing the output with minimal input. In the study, it was estimated that on an average Micro and Small enterprises invested Birr 4,349 and 6,603 respectively in ICT gadgets/instruments. The t-test revealed that average invested capital utilization on ICT significantly different between Micro and Small enterprises at less than one per cent level (t test =27.66, p= 0.000). Among the study respondents, 88 per cent relied on mobiles phones alone to growth/diversify enterprises. This showed the wider gap prevailing among enterprises in harnessing ICT to its full potential. Hence, MSEs could use computers for book keeping, documentation like files maintenances, and networking, communication, etc. Similar technological gap was evident from the study of Admassie (2002) and Belay (2012).

Household Size: Generally, large family size has a negative impact on the development and efficiency of MSEs. An increase in family size is strongly associated with an increase in social and economic needs that are often met by diverting financial resources out of income generated by MSEs. The average national household size of Ethiopia according to the most recent CSA survey was 4.8 persons (CSA, 2011). The average household size of the sampled respondents was 4.36, 4.28 and 4.30 for the Micro, Small and both enterprises categories respectively. The results showed that the average size of the sampled household was less than the national average. This was due to the fact that most of the respondents were younger having less off springs. Besides, the study was held among urban centers and urban household size was lower that of rural as per national statistics. The t-test revealed that the variable had significant difference between Micro and Small enterprises at one per cent significant level (t =36.08, p= 0.000). This finding was consonant with the study of ILO (2003) that of Ethiopian women entrepreneurs.

Start-Up Capital: Many MSEs started operations with very low amount of initial capital which affects efficiency of enterprises. Majority of the operators were 'Necessity' promoters (pushed to start enterprises out of sheer poverty/economic necessity) rather than 'Opportunity' promoters. Over the time, some promoters turn the small units into more profitable ones. The average startup capital for sampled enterprises was 20,685 Birr. Perhaps owing to inflation and location of the studies and choice of the sector investigated the startup capital value found by earlier researchers, by Belay, (2012) was 6830 Birr. About 48 percent of the MSEs had initial capital of over 20,000 Birr (see Table-----). The t-test revealed that the variable had significant difference between micro and small enterprises at less than one per cent level (t =23.939, p= 0.000). The finding is consonant with that of (Belay, 2012 and ILO, 2003).

Managerial training: Bekele and Zeleke (2009) had argued that entrepreneurship training was an important input for enterprise efficiency. It not only familiarized entrepreneurs with process and organizational function but also helped entrepreneurs to establish network with suppliers and buyers. As presented in Table---- the duration of annual average training given to micro, small and both enterprises promoter was 2.2, 2.31and 2.24 months respectively. However, our data clearly revealed that duration of training provided for the workers and promoters was inadequate efficiently to manage enterprise, as ascertained through responses of Focus Group Discussion. The results reiterate the concerns expressed by MTI, (1997) and MUCD, (2013) level of training was made available to MSEs. The lack of training institutions adequately equipped for training MSEs was the key reason for the poor performance of the MSEs sector (Gebyehu and Assefa, 2004 ; MUCD, 2013). The t- test revealed that average training provided for promoters had significant difference between micro and small enterprises at less than one per cent significant level (t =22.79, p= 0.000).The result of this finding was in line with that of Bekele and Zeleke , (2009) and MUCD, (2013) who studied formal Micro and Small enterprises in major cities of Ethiopia.

Business Plan: Fortune (2003) and Zeleke and Bekele (2009 had found out that MSEs often collapsed due to inefficiency in financial management and absence of sound business plan. They further revealed that sizeable portion of MSEs lacked technical skills to prepare sound business plans to secure/use institutional credit. This resulted in financial leakage and higher opportunity costs of resources. In this study, it was interesting to note that only 9 per cent of MSE owners were without business development plans. The rest (91 per cent) had business plans. However, the plans so prepared were sketchy, had improper business projections behind them and consequently were unacceptable to formal financial institution for getting the credit. In depth interview with financial institutions revealed the inability of the small business owners to produce sound business plans as the principal reason for declining their request for credit. It is well known that information asymmetric and fear of moral hazards make the bankers develop cold shoulder to lend to MSEs. Regular and updated records enable MSE owners to track the cash inflow and outflow, thereby minimizing the operational risks and optimizing the profit. Similar findings were reported and recommendations made by MUCD (2013).

Age of the enterprises: age of the enterprises would provide knowledge of organizational routines and necessary skills enabling the promoters to apply them to the current business (Delmar and Shane, 2006; Belay, 2012). A related business age gives owners the required technical skill necessary to start and run the current business

efficiently. As presented in Table--- average previous promoters work experience of Micro, Small and both enterprises was 4.67, 4.93 and 4.75 years respectively. The t-test revealed that the variable had significant difference between micro and small enterprises at less than one per cent significant level (t =60.79, p= 0.000). The descriptive result of this study found support from previous findings of (Liedholm and Mead, 1999).

Table No 2 Characteristics of Enterprise and Promoters

Variables	Category	Micro (n=265)	Small (n=87)	Total (n=352)	χ2/t value
Startup capital	Average	17991(13100)	28890(21300)	20685(16210)	23.94***
ICT Investment	Average	4349(1691)	6603(5701)	4906(3326)	27.66***
Age of the promoters	(Mean)	33.6(0.42)	32.98(0.70)	33.3(0.67)	90.837***
Managerial training	Average	2.22(1.27)	2.31(1.23)	2.24(1.26)	22.79***
Age of the enterprise	Average	4.67(0.07)	4.93(0.14)	4.75(1.19)	60.79***
Family size	(Mean)	4.36(1.50)	4.20(1.70)	4.49(1.80)	43.83***
Business plan (%)	Yes	91	90	91	435.8***
	No	9	10	9	

n=small size, *** indicates that statistically significant difference between sectors at less than1% and 10% significant level, respectively .source; competed from field survey from 2015/16

Technical Efficiencies of MSEs

The issue of technical efficiency has received considerable attention among other things, its output augmenting or input conserving impacts. Technical efficiency is concerned with the maximization of output for a given set of inputs and indicates how far the MSEs can increase its output without absorbing further resources. Data Envelopment Analysis (DEA) has been overwhelmingly dominating and the concept of technical efficiency is elaborated by (McDonald, 2009).

Analyzing technical efficiencies would indicate whether there exists any scope for improvement in technical efficiencies of MSEs. The distribution of the technical efficiencies for the sample MSEs were presented in Table 3. Based on the analysis, MSEs in the study area were found to be technically inefficient relative to their potential. The estimated technical efficiency scores for the sampled MSEs ranged from less than 0.40 to more than 0.90, with a sample mean technical efficiency level of 0.61. By considering both MSEs the maximum estimated efficiency was 0.93 in small enterprises while the minimum was 0.25 in micro enterprises, and the mean level of technical efficiency was 0.61 in both MSEs. According to Radam *et al.,(*2008) and Grabowski *et al.,* (1990), a firm is considered technically inefficient even if the firm registered a technical efficiency index of 0.82. By this standard, the number of MSEs considered technically efficient was only index of 0.07 from the both MSE. The MSEs analyzed in this study comprised of micro and small enterprises. In the general economic sense, by virtue of firm size, resource allocations, lower per unit cost and technology adoption, the small enterprises are supposed to attain the highest efficiency level. A higher standard deviation for small enterprises shows generally low performance even though the maximum efficiency index is 93. The results indicate that there might be some resource misallocation in the small enterprise industries. This requires further investigations as to what are the causes of the low efficiency.

Table 3. Distribution of technical efficiency of MSEs in Wolaita Zone

Efficiency Range	Number/proportion of Enterprises		
	Both Enterprises	Micro Enterprises	Small Enterprises
0.00-0.40	27(0.08)	23(0.09)	4(0.05)
0.41-0.50	44(0.13)	34(0.13)	10(0.11)
0.51-0.60	93(0.26)	78(0.29)	15(0.17)
0.61-0.70	93(0.26)	79(0.30)	14(0.16)
0.71-0.80	61(0.16)	37(0.14)	24(0.28)
0.81-0.90	20(0.06)	9(0.03)	11(0.13)
0.91-1.00	16(0.05)	5(0.02)	9(0.10)
N	352(1.00)	265(1.00)	87(1.00)
Mean	0.61	0.59	0.67
Std. Deviation	0.146	0.134	0.162
Maximum	0.93	0.92	0.93
Minimum	0.25	0.25	0.28

Source: Field Survey, 2015/16 *Note:* Figures in parentheses are proportions.

3.2 Econometrics Analysis

Determinants of Efficiencies among MSEs in Wolaita Zone, Ethiopia

The overall goodness of fit for the model parameter estimates was assessed based on several criteria. First, it was found that the correlations between the dependent and independent equations was significantly different from zero the ($\rho \neq 0$), which confirmed that the application of Tobit was valid and it was statistically a true stochastic specification. The distributions are independent if and only if $\rho = 0$. The relationship between the dependent and

independent equations can be estimated consistently with the single-equation Tobit method. However, such a commonly used approach was inefficient because it ignored the correlation between the error terms of the underlying stochastic production functions (Maddala, 1999; Greene, 2003).

Finally, the validity of the constraint was examined empirically by usual statistical test statistics as well as LR or Wald test. The overall fit of the equations indicated that LR: the $\chi 2$ (**12**) statistics = 45.79, $\chi 2$ (12) statistics = 47.78 and $\chi 2$ (12) statistics = 16.76 were significant at less than one per cent significance level in both MSEs together and micro enterprises category and 10 per cent significant level small enterprises category. Based on the outcome of this test, the study yielded the basis to reject the null hypothesis at reasonable level of significance. Hence, the model thus had a good fit Table 4.

Model estimated results

Age (AGE): The level of technical efficiency of MSEs was positively and significantly affected by the age of the promoters at less than 5 per cent significant level in both MSEs together and small enterprises category. The marginal effect indicted that one year increase in promoters age would increase the probability of both MSEs together and small enterprises category to be technically efficient by 0.2 and 0.5 per cent respectively while keeping all others variables remains constant. This implied that, aged promoters in the sampled MSEs had much time and maturity to run the units efficiently. The old entrepreneurs have less leisure time and even to attend family responsibilities compared to youngsters in most African countries (All their energies would be channelized towards enterprise success). Older and experienced promoters were found to use technical and human skilled manpower leading to higher efficiency. Likewise, earlier MSE studies indicated the positive influence of producer age on MSEs technical efficiency (Adugna, 2009; Mashimba et al, 2014 and Gebreeyesus, 2009).

Amount of Initial capital (INCAP): Amount of initial capital measured in Birr was positively and significantly affected the level of technical efficiency at less than 5 per cent significant level in micro enterprises category. The marginal effect indicated that a one Birr increase of enterprises in startup capital would increase the probability of technical efficiency by small figure percentages reductions in microenterprises category while keeping all others variables remains constant. This might be due to precautions observed by micro enterprises endowed with smaller initial capital to run the units efficiently to avoid business failure. In other words they were forced to use the available inputs judiciously to maximize the outputs (typical indicator of efficiency).Similar results had been reported by other researchers as Solomon, (2004); Fekirte and Endrias, (2013); Astede *et al.* (2008)

Vocation training (VOCT): Technical/ vocational training was positively and significantly affected to the level of technical efficiency at less than 1 per cent significant level in both MSEs together and micro enterprises category respectively. The marginal effect indicted that a unit change in acquisition of vocational training would increase the probability of both MSEs together and small enterprises category to be technically efficient by 1.4 per cent respectively while assuming all other factors remain constant. This implies that MSEs owners had acquired one more additional unit of vocational training lead to towards narrowing technical inefficiency gap. This further implies that vocational training enhances human resources capabilities and likely enhances the ability of entrepreneurs to access and use efficiency enhancing knowledge and have to adopt more attitudes towards modernization and risk taking. Besides, MSEs that had content of skilled manpower are likely to become more efficient over time and would be able to narrow the inefficiency gap. Empirical studies also reported a positive relationship between firm efficiency and vocational training (Sriboonchitta1 and Wiboonpongse, 2006) and positive finding of (Admassie and Matambalya, 2002).

Information, Communication and Technology (CAICT): Investment in information and communication technology (ICT) could be considered as the direct efficiency enhancing investment had positive influence on the level of technical efficiency at less than 1 per cent significance level in both MSEs together and micro enterprises category respectively. The marginal effect indicated that a one Birr increase investment in acquisition of ICT would increase the probability of both MSEs together and micro enterprises category to be technical efficient by a small figure percentages increment while assuming all other independent variables remain constant. This implies that investment in information technology (ICT) would have enabled enterprises to overcome the production constraints. Technological change increases the efficiency with which business operations are executed and also affect the amounts of resources allocated to factor inputs, i.e., labor, physical capital and production material. Information technology helps to change the relationship between inputs and outputs by producing optimum output from the minimum level of inputs. Unless MSEs invest the minimum threshold level of investment in ICT, the mere acquisition of some information technology equipment might not necessarily increase technical efficiency. Therefore, investment in ICT capital has been included in this study that analyzes the effect of ICTs on MSEs performance in the study area. The ICTs is used because every additional investment in ICT is expected to have a greater influence on technical efficiency. This study was consonant with the finding of (Admassie and Matambalya, 2002; Radam, *et al.*, 2008).

Social networks (SNET): Social-net workings of MSEs were positively and significantly affected to technical efficiency at less than 10 and 5 per cent significant level in both MSE together and small enterprises category. Marginal effect indicted that a change in the dummy variable representing the use of social networking of

promoters' relationship with economic agents from 0 to 1 would increase the probability of both MSEs together and small enterprises to enhance under efficient category by about 0.7 and 1.2 per cent respectively while keeping all other variables remain constant. This implies social networking between small business owners and external actors (person or organization) relationship are strong it favors technical efficiency. MSEs have different problems that link with their smallness but can be solved through networking. Such problems include: limited capacity to produce standardized and good quality product; difficulties in achieving economies of scale in the purchase of input like raw material, equipment, finance, and consultancy services; and limited opportunity for technology, training, through innovation services obtained from public and NGOs' intervention. In this finding social capital such as friends or relatives, Iqub/Iders and personal relation plays significant role in enhance technical efficiency. Hence, social cohesion and mutual support help MSEs to survive and learn their surroundings. The finding was consistent with (Eshetu and Zeleke , 2008).

Size of the enterprises (FSIZE): Size of the MSEs was negatively and significantly affected to technical efficiency at less than 10 per cent significance level in both MSEs together and micro enterprises category respectively. The marginal effect indicted that a unit change in enterprises size would decrease the probability of technically efficiency both MSEs together and small enterprises category by 0.7 and 0.8 per cent respectively while keeping all other variables remain constant. The negative relation between MSEs efficiency and size could be due to underutilization of MSEs resources (Gebreeyesus, 2007). Such idle resources arose because of the indivisible nature of resources. The extent to which MSEs can employ the most advantageous division of labor depends on the scale of its operation; the smaller its output the less can its resource be used in a specialized manner. The smaller of MSEs have the greater indivisible and slack resources. All these reasons were attributable to the negative relations between the form size and the technical efficiency. The study was consistent with (Gebreeyesus, 2007).

Family size (FASIZE): Family size of the MSE operators was negatively and significantly affected technical efficiency at less than 5 per cent significance level in micro enterprises category. The marginal effect indicated that as the family size increased by one member would decrease the probability of microenterprises to be technically efficient by 1.1 per cent ceterus paribus. This implies that increase in family size was found to have higher social and economic needs that were often met by diverting financial resources out of income generated by MSEs. The result further implied that as MSEs owners' family size increased, productivity, survival and profitability, etc, got compromised. This finding was consonant with that of Eshetu and Zeleke, (2008).However, some studies identified that household size positively affected technical efficiency (ILO, 2003).

Business Plan (BUSPL): Contrary to expectation, this variable negatively and significantly affected level of technical efficiency at less than 10 per cent significant level in micro enterprises. The marginal effect indicted that a change in the dummy variable represents having of the formal planning done by MSEs from 0 to 1 would decrease the probability of both MSEs together and small enterprises category to fall under inefficient category by about 4.4 per cent while assuming all other factors remain constant. This implies that in the study area the business plans and record keeping practice were irregular and unorganized that make less likely enables MSEs owners to calculate risk associated with production, marketing, and purchasing decisions by clearly determining expenditures and sales/ income. This further implies that small business by nature as such do not have proper business plans this in turn makes them not to be able to assess the firm's internal performance, fail to access funds such as loans, and also be exposed to the higher risk of venture failure and decrease the MSEs' chances of growing and surviving in the market. The study was consonant with finding (MUCD, 2013; Sriboonchitta1 and Wiboonpongse, 2006.

Table 4 **Empirical Estimates of Tobit Model**

Variables	Both MSEs Together		Micro-Enterprises Category		Small-Enterprises Category	
	Coef.	Marg	Coef	Marg	Coef	Marg
CONS	0.711***		0.733***		0.542	
	(0.072)		(0.084)		(0.136)	
AGE	0.002*	0.002	0.001	0.001	0.005**	0.005
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
INCAP	5.6e-07	4.35e-07	1.41e-06**	1.34e-06	4.81e-07	4.48e-07
	(4.3e-07)	(4.1e-07)	(5.7e-06)	(5.5e-06)	(6.59e-07)	(6.13e-07)
LOC	-0.018	-0.017	-0.001	-0.001	0.027	0.025
	(0.015)	(0.014)	(0.017)	(0.001)	(0.029)	(0.027)
AGEF	-0.003	-0.003	-0.003	0.003	-0.002	0.001
	(0.005)	(0.005)	(0.006)	(0.006)	(0.010)	(0.009)
MTRID	0.005	0.005	0.006	0.007	0.012	0.011
	(0.017)	(0.014)	(0.019)	(0.019)	(0.033)	(0.031)
AFIND	0.005	0.007	0.005	0.004	0.015	0.014
	(0.015)	(0.005)	(0.017)	(0.017)	(0.028)	(0.026)
VOCT	0.056***	0.014	0.064***	0.001	0.015	0.014
	(0.015)	(0.014)	(0.016)	(0.016)	(0.032)	(0.029)
FASIZE	-0.006	-0.006	-0.012**	- 0.011	-0.004	-0.004
	(0.004)	(0.004)	(0.005)	(0.005)	(0.008)	(0.007)
CAICT	5.5e-06***	5.3e-06	0.0001***	9.5e-06	3.27e-06	3.04e-06
	(2.1e-06)	(2.0e-06)	(3.6e-06)	(3.4e-06)	(2.58e-06)	(2.39e-06)
SNETD	0.007*	0.007	0.004	0.004	0.017**	0.012
	(0.0039)	(0.0036)	(0.004)	(0.004)	(0.008)	(0.007)
BUSPL	-0.018	-0.017	-0.046*	-0.044	0.052	0.048
	(0.023)	(0.022)	(0.026)	(0.02)	(0.045)	(0.041)
FSIZE	-0.008*	-0.007	-0.009*	-0.008	-0.009	-0.008
	(0.004)	(0.004)	(0.005)	(0.005)	(0.009)	(0.008)
N= 352			N= 265		N= 87	
Log likelihood = 198.82			Log likelihood = 154.48		Log likelihood = 53.14	
LR $\chi 2$ (12)= 45.79			LR $\chi 2$ (12)=47.78		LR $\chi 2$ (12)=16.76	
Prob($\chi 2$)>F=0.0000			Prob($\chi 2$)>F=0.0000		Prob($\chi 2$)>F=0.015	

Source: Field Survey, (2015). Note: ***, ** and * indicate that statistically significant at less than 1%, 5% and 10% significant level, respectively. Marg= marginal

4. CONCLUSION AND IMPLICATION

In this study we have estimated the Data envelopment analysis and predicted enterprises specific efficiencies on the basis of a sample of 352 micro and small enterprises in Wolaita Zone Ethiopia. We have also explained the predicted efficiency levels by individual, firm and social capital related factors. The estimated technical efficiency scores for the sampled MSEs ranged from less than 0.40 to more than 0.90, with a sample mean technical efficiency level of 0.61. By considering both MSEs the maximum estimated efficiency was 0.93 in small enterprises while the minimum was 0.25 in micro enterprises, and the mean level of technical efficiency was 0.61 in both MSEs. A firm is considered technically inefficient even if the firm registered a technical efficiency index of 0.82 Grabowski *et al.,* (1990). By this standard, the number of MSEs considered technically efficient was only index of 0.07 from both MSE together.

Results of Tobit model indicated that technical efficiency of MSEs depends on explanatory variables: age of the promoters, training of the promoters, vocational training, access to finance, family size, location of the enterprises, enterprises age, organizational plan, investment on ICT, Initial capital, firm size, social networking. The results of the model revealed that age of promoters; initial capital, vocational training, social networking and investment in ICT significantly and positively affected technical efficiency while business plan, family size and firm size contributed significantly and negatively to technical efficiencies. These results suggest that increased investment in ICT and vocational training of management and workers could jointly contribute to an improvement in technical efficiency.

Given the resource constraints facing MSEs, there is no choice but to improve internal efficiency significantly in order to become competitive in the local, regional as well as national market. Several firm-specific

characteristics such as managerial skill, adoption of ICTs, size and social networking as well as improvement business plan of firms factors may have significant implications on the firm-level technical efficiency. Hence, efficiency gains could come from the improvement in the managerial skill in technical training of the labour force and management, and investment in ICTs. It is imperative that the government should provide support with respect to timely and adequate supply of quality inputs and training, affordable and timely credit facilities. In addition, MSEs development needs to be further consolidated with the promotion of economies of scale in the MSEs operations. Efficiency shall be the focus of MSEs in order to sustain growth. In order to achieve this aspiration, improving and strengthen inter-firm level relation and social capital have to play significant roles in promotion of economies of scale in to achieve efficiency in MSEs.

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